

CLAIMS

{Claim 1}

5 A method of evaluating inhibitory effect on damp-dry malodor, comprising the steps of:

bringing microorganisms which produce damp-dry malodor-causing substances and a test substance into contact with each other in the presence of a sebaceous dirt component;

10 detecting expression of at least one kind of gene selected from a group consisting of a fatty acid desaturase gene and a β oxidation-related enzyme gene derived from the microorganisms; and thereby

evaluating a damp-dry malodor inhibitory function of the test substance based on a change in expression amount of the at least one kind of gene; wherein the expression of the at least one kind of gene is detected by using at least one
15 kind of oligonucleotide pair selected from the group consisting of:

an oligonucleotide pair containing oligonucleotides (a) and (b) described below,
an oligonucleotide pair containing oligonucleotides (c) and (d) described below,
an oligonucleotide pair containing oligonucleotides (e) and (f) described below,
an oligonucleotide pair containing oligonucleotides (g) and (h) described below,
20 an oligonucleotide pair containing oligonucleotides (i) and (j) described below,
an oligonucleotide pair containing oligonucleotides (k) and (l) described below,
an oligonucleotide pair containing oligonucleotides (m) and (n) described below,
an oligonucleotide pair containing oligonucleotides (o) and (p) described below,
an oligonucleotide pair containing oligonucleotides (q) and (r) described below,
25 an oligonucleotide pair containing oligonucleotides (s) and (t) described below,
an oligonucleotide pair containing oligonucleotides (u) and (v) described below,
an oligonucleotide pair containing oligonucleotides (w) and (x) described below,
an oligonucleotide pair containing oligonucleotides (y) and (z) described below,
an oligonucleotide pair containing oligonucleotides (a1) and (b1) described below, and
30 an oligonucleotide pair containing oligonucleotides (c1) and (d1) described below:
(a) an oligonucleotide having the base sequence set forth in SEQ ID NO: 13, an oligonucleotide having a base sequence set forth in SEQ ID NO: 13 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for

- detecting the fatty acid desaturase gene;
- (b) an oligonucleotide having the base sequence set forth in SEQ ID NO: 14, an oligonucleotide having a base sequence set forth in SEQ ID NO: 14 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for
- 5 detecting the fatty acid desaturase gene;
- (c) an oligonucleotide having the base sequence set forth in SEQ ID NO: 15, an oligonucleotide having a base sequence set forth in SEQ ID NO: 15 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- 10 (d) an oligonucleotide having the base sequence set forth in SEQ ID NO: 16, an oligonucleotide having a base sequence set forth in SEQ ID NO: 16 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (e) an oligonucleotide having the base sequence set forth in SEQ ID NO: 17, an
- 15 oligonucleotide having a base sequence set forth in SEQ ID NO: 17 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (f) an oligonucleotide having the base sequence set forth in SEQ ID NO: 18, an oligonucleotide having a base sequence set forth in SEQ ID NO: 18 with a substitution,
- 20 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (g) an oligonucleotide having the base sequence set forth in SEQ ID NO: 19, an oligonucleotide having a base sequence set forth in SEQ ID NO: 19 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for
- 25 detecting the fatty acid desaturase gene;
- (h) an oligonucleotide having the base sequence set forth in SEQ ID NO: 20, an oligonucleotide having a base sequence set forth in SEQ ID NO: 20 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- 30 (i) an oligonucleotide having the base sequence set forth in SEQ ID NO: 21, an oligonucleotide having a base sequence set forth in SEQ ID NO: 21 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;

- (j) an oligonucleotide having the base sequence set forth in SEQ ID NO: 22, an oligonucleotide having a base sequence set forth in SEQ ID NO: 22 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- 5 (k) an oligonucleotide having the base sequence set forth in SEQ ID NO: 23, an oligonucleotide having a base sequence set forth in SEQ ID NO: 23 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (l) an oligonucleotide having the base sequence set forth in SEQ ID NO: 24, an
- 10 oligonucleotide having a base sequence set forth in SEQ ID NO: 24 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (m) an oligonucleotide having the base sequence set forth in SEQ ID NO: 25, an oligonucleotide having a base sequence set forth in SEQ ID NO: 25 with a substitution,
- 15 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (n) an oligonucleotide having the base sequence set forth in SEQ ID NO: 26, an oligonucleotide having a base sequence set forth in SEQ ID NO: 26 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for
- 20 detecting the β oxidation-related enzyme gene;
- (o) an oligonucleotide having the base sequence set forth in SEQ ID NO: 27, an oligonucleotide having a base sequence set forth in SEQ ID NO: 27 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- 25 (p) an oligonucleotide having the base sequence set forth in SEQ ID NO: 28, an oligonucleotide having a base sequence set forth in SEQ ID NO: 28 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (q) an oligonucleotide having the base sequence set forth in SEQ ID NO: 29, an
- 30 oligonucleotide having a base sequence set forth in SEQ ID NO: 29 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (r) an oligonucleotide having the base sequence set forth in SEQ ID NO: 30, an

- oligonucleotide having a base sequence set forth in SEQ ID NO: 30 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (s) an oligonucleotide having the base sequence set forth in SEQ ID NO: 31, an
- 5 oligonucleotide having a base sequence set forth in SEQ ID NO: 31 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (t) an oligonucleotide having the base sequence set forth in SEQ ID NO: 32, an
- oligonucleotide having a base sequence set forth in SEQ ID NO: 32 with a substitution,
- 10 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (u) an oligonucleotide having the base sequence set forth in SEQ ID NO: 33, an
- oligonucleotide having a base sequence set forth in SEQ ID NO: 33 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for
- 15 detecting the β oxidation-related enzyme gene;
- (v) an oligonucleotide having the base sequence set forth in SEQ ID NO: 34, an
- oligonucleotide having a base sequence set forth in SEQ ID NO: 34 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- 20 (w) an oligonucleotide having the base sequence set forth in SEQ ID NO: 35, an
- oligonucleotide having a base sequence set forth in SEQ ID NO: 35 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (x) an oligonucleotide having the base sequence set forth in SEQ ID NO: 36, an
- 25 oligonucleotide having a base sequence set forth in SEQ ID NO: 36 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (y) an oligonucleotide having the base sequence set forth in SEQ ID NO: 37, an
- oligonucleotide having a base sequence set forth in SEQ ID NO: 37 with a substitution,
- 30 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (z) an oligonucleotide having the base sequence set forth in SEQ ID NO: 38, an
- oligonucleotide having a base sequence set forth in SEQ ID NO: 38 with a substitution,

deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;

(a1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 39, an oligonucleotide having a base sequence set forth in SEQ ID NO: 39 with a substitution,

5 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;

(b1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 40, an oligonucleotide having a base sequence set forth in SEQ ID NO: 40 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for

10 detecting the β oxidation-related enzyme gene;

(c1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 41, an oligonucleotide having a base sequence set forth in SEQ ID NO: 41 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene; and

15 (d1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 42, an oligonucleotide having a base sequence set forth in SEQ ID NO: 42 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene.

20 {Claim 2}

The method according to Claim 1, wherein the damp-dry malodor-causing substances are 4-methyl-3-hexenoic acid.

{Claim 3}

25 The method according to Claim 1 or 2, wherein the sebaceous dirt component is an anteiso fatty acid.

{Claim 4}

The method according to any one of Claims 1 to 3, wherein the fatty acid
30 desaturase gene is $\Delta 9$ desaturase gene.

{Claim 5}

The method according to Claim 4,

wherein the expression of the $\Delta 9$ desaturase gene is detected by using at least one kind of oligonucleotide pair selected from the group containing :

the oligonucleotide pair containing the oligonucleotides (a) and (b);

the oligonucleotide pair containing the oligonucleotides (c) and (d);

5 the oligonucleotide pair containing the oligonucleotides (e) and (f);

the oligonucleotide pair containing the oligonucleotides (g) and (h);

the oligonucleotide pair containing the oligonucleotides (i) and (j); and

the oligonucleotide pair containing the oligonucleotides (k) and (l).

10 {Claim 6}

The method according to any one of Claims 1 to 3, wherein the β oxidation-related enzyme gene is at least one kind of gene selected from the group consisting of fadB gene and fadD gene.

15 {Claim 7}

The method according to Claim 6,

wherein the expression of the fadB gene is detected by using at least one kind of oligonucleotide pair selected from the group consisting of:

the oligonucleotide pair containing the oligonucleotides (m) and (n);

20 the oligonucleotide pair containing the oligonucleotides (o) and (p);

the oligonucleotide pair containing the oligonucleotides (q) and (r); and

the oligonucleotide pair containing the oligonucleotides (s) and (t).

{Claim 8}

25 The method according to Claim 6,

wherein the expression of the fadD gene is detected by using at least one kind of oligonucleotide pair selected from the group consisting of :

the oligonucleotide pair containing the oligonucleotides (u) and (v);

the oligonucleotide pair containing the oligonucleotides (w) and (x);

30 the oligonucleotide pair containing the oligonucleotides (y) and (z);

the oligonucleotide pair containing the oligonucleotides (a1) and (b1); and

the oligonucleotide pair containing the oligonucleotides (c1) and (d1).

{Claim 9}

The method according to any one of Claims 1 to 8, wherein the microorganisms are at least one kind of microbial strain selected from the group consisting of species of Moraxella sp. and Moraxella osloensis.

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{Claim 10}

A method of screening a damp-dry malodor inhibitor, which comprises selecting a test substance capable of reducing the expression amount of the at least one kind of gene, based on the method described in any one of Claims 1 to 9.

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{Claim 11}

A method of detecting microorganisms which produce damp-dry malodor-causing substances, comprising the steps of:

amplifying at least one kind of fragment of gene selected from a group consisting of a fatty acid desaturase gene and a β oxidation-related enzyme gene that are derived from microorganisms which produce damp-dry malodor-causing substances; determining the presence or absence of an amplified fragment; and thereby detecting the microorganisms which produce damp-dry malodor-causing substances,

wherein the detection of the microorganisms which produce damp-dry malodor-causing substances is performed by using at least one kind of oligonucleotide pair selected from the group consisting of:

an oligonucleotide pair containing oligonucleotides (a) and (b) described below,
an oligonucleotide pair containing oligonucleotides (c) and (d) described below,
an oligonucleotide pair containing oligonucleotides (e) and (f) described below,
an oligonucleotide pair containing oligonucleotides (g) and (h) described below,
an oligonucleotide pair containing oligonucleotides (i) and (j) described below,
an oligonucleotide pair containing oligonucleotides (k) and (l) described below,
an oligonucleotide pair containing oligonucleotides (m) and (n) described below,
an oligonucleotide pair containing oligonucleotides (o) and (p) described below,
an oligonucleotide pair containing oligonucleotides (q) and (r) described below,
an oligonucleotide pair containing oligonucleotides (s) and (t) described below,
an oligonucleotide pair containing oligonucleotides (u) and (v) described below,

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an oligonucleotide pair containing oligonucleotides (w) and (x) described below,
an oligonucleotide pair containing oligonucleotides (y) and (z) described below,
an oligonucleotide pair containing oligonucleotides (a1) and (b1) described below, and
an oligonucleotide pair containing oligonucleotides (c1) and (d1) described below:

- 5 (a) an oligonucleotide having the base sequence set forth in SEQ ID NO: 13, an oligonucleotide having a base sequence set forth in SEQ ID NO: 13 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (b) an oligonucleotide having the base sequence set forth in SEQ ID NO: 14, an
10 oligonucleotide having a base sequence set forth in SEQ ID NO: 14 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (c) an oligonucleotide having the base sequence set forth in SEQ ID NO: 15, an oligonucleotide having a base sequence set forth in SEQ ID NO: 15 with a substitution,
15 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (d) an oligonucleotide having the base sequence set forth in SEQ ID NO: 16, an oligonucleotide having a base sequence set forth in SEQ ID NO: 16 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for
20 detecting the fatty acid desaturase gene;
- (e) an oligonucleotide having the base sequence set forth in SEQ ID NO: 17, an oligonucleotide having a base sequence set forth in SEQ ID NO: 17 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- 25 (f) an oligonucleotide having the base sequence set forth in SEQ ID NO: 18, an oligonucleotide having a base sequence set forth in SEQ ID NO: 18 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (g) an oligonucleotide having the base sequence set forth in SEQ ID NO: 19, an
30 oligonucleotide having a base sequence set forth in SEQ ID NO: 19 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (h) an oligonucleotide having the base sequence set forth in SEQ ID NO: 20, an

- oligonucleotide having a base sequence set forth in SEQ ID NO: 20 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (i) an oligonucleotide having the base sequence set forth in SEQ ID NO: 21, an
5 oligonucleotide having a base sequence set forth in SEQ ID NO: 21 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (j) an oligonucleotide having the base sequence set forth in SEQ ID NO: 22, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 22 with a substitution,
10 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (k) an oligonucleotide having the base sequence set forth in SEQ ID NO: 23, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 23 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
15 detecting the fatty acid desaturase gene;
- (l) an oligonucleotide having the base sequence set forth in SEQ ID NO: 24, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 24 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
detecting the fatty acid desaturase gene;
- 20 (m) an oligonucleotide having the base sequence set forth in SEQ ID NO: 25, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 25 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
detecting the β oxidation-related enzyme gene;
- (n) an oligonucleotide having the base sequence set forth in SEQ ID NO: 26, an
25 oligonucleotide having a base sequence set forth in SEQ ID NO: 26 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
detecting the β oxidation-related enzyme gene;
- (o) an oligonucleotide having the base sequence set forth in SEQ ID NO: 27, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 27 with a substitution,
30 deletion, insertion, or addition of 1 or several nucleotides which can be used for
detecting the β oxidation-related enzyme gene;
- (p) an oligonucleotide having the base sequence set forth in SEQ ID NO: 28, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 28 with a substitution,

deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;

- 5 (q) an oligonucleotide having the base sequence set forth in SEQ ID NO: 29, an oligonucleotide having a base sequence set forth in SEQ ID NO: 29 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (r) an oligonucleotide having the base sequence set forth in SEQ ID NO: 30, an oligonucleotide having a base sequence set forth in SEQ ID NO: 30 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for
10 detecting the β oxidation-related enzyme gene;
- (s) an oligonucleotide having the base sequence set forth in SEQ ID NO: 31, an oligonucleotide having a base sequence set forth in SEQ ID NO: 31 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- 15 (t) an oligonucleotide having the base sequence set forth in SEQ ID NO: 32, an oligonucleotide having a base sequence set forth in SEQ ID NO: 32 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (u) an oligonucleotide having the base sequence set forth in SEQ ID NO: 33, an
20 oligonucleotide having a base sequence set forth in SEQ ID NO: 33 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (v) an oligonucleotide having the base sequence set forth in SEQ ID NO: 34, an oligonucleotide having a base sequence set forth in SEQ ID NO: 34 with a substitution,
25 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (w) an oligonucleotide having the base sequence set forth in SEQ ID NO: 35, an oligonucleotide having a base sequence set forth in SEQ ID NO: 35 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for
30 detecting the β oxidation-related enzyme gene;
- (x) an oligonucleotide having the base sequence set forth in SEQ ID NO: 36, an oligonucleotide having a base sequence set forth in SEQ ID NO: 36 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for

- detecting the β oxidation-related enzyme gene;
- (y) an oligonucleotide having the base sequence set forth in SEQ ID NO: 37, an oligonucleotide having a base sequence set forth in SEQ ID NO: 37 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for
- 5 detecting the β oxidation-related enzyme gene;
- (z) an oligonucleotide having the base sequence set forth in SEQ ID NO: 38, an oligonucleotide having a base sequence set forth in SEQ ID NO: 38 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- 10 (a1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 39, an oligonucleotide having a base sequence set forth in SEQ ID NO: 39 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (b1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 40, an
- 15 oligonucleotide having a base sequence set forth in SEQ ID NO: 40 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (c1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 41, an oligonucleotide having a base sequence set forth in SEQ ID NO: 41 with a substitution,
- 20 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene; and
- (d1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 42, an oligonucleotide having a base sequence set forth in SEQ ID NO: 42 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for
- 25 detecting the β oxidation-related enzyme gene.

{Claim 12}

The method according to Claim 11, wherein the damp-dry malodor-causing substances are 4-methyl-3-hexenoic acid.

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{Claim 13}

The method according to Claim 11 or 12, wherein the fatty acid desaturase gene is $\Delta 9$ desaturase gene.

{Claim 14}

The method according to Claim 13,
wherein a fragment of the $\Delta 9$ desaturase gene is amplified by using at least one kind of
5 oligonucleotide pair selected from the group consisting of:
the oligonucleotide pair containing the oligonucleotides (a) and (b);
the oligonucleotide pair containing the oligonucleotides (c) and (d);
the oligonucleotide pair containing the oligonucleotides (e) and (f);
the oligonucleotide pair containing the oligonucleotides (g) and (h);
10 the oligonucleotide pair containing the oligonucleotides (i) and (j); and
the oligonucleotide pair containing the oligonucleotides (k) and (l).

{Claim 15}

The method according to Claim 11 or 12, wherein the β oxidation-related
15 enzyme gene is at least one kind of gene selected from the group consisting of fadB
gene and fadD gene.

{Claim 16}

The method described in according to Claim 15,
20 wherein a fragment of the fadB gene is amplified by using at least one kind of
oligonucleotide pair selected from the group consisting of:
the oligonucleotide pair containing the oligonucleotides (m) and (n);
the oligonucleotide pair containing the oligonucleotides (o) and (p);
the oligonucleotide pair containing the oligonucleotides (q) and (r); and
25 the oligonucleotide pair containing the oligonucleotides (s) and (t).

{Claim 17}

The method according to Claim 15,
wherein a fragment of the fadD gene is amplified by using at least one kind of
30 oligonucleotide pair selected from the group consisting of:
the oligonucleotide pair containing the oligonucleotides (u) and (v);
the oligonucleotide pair containing the oligonucleotides (w) and (x);
the oligonucleotide pair containing the oligonucleotides (y) and (z);

the oligonucleotide pair containing the oligonucleotides (a1) and (b1); and
the oligonucleotide pair containing the oligonucleotides (c1) and (d1).

{Claim 18}

5 The method according to any one of Claims 11 to 17, wherein the
microorganisms are at least one kind of microbial strain selected from the group
consisting of species of Moraxella sp. and Moraxella osloensis.

{Claim 19}

10 An oligonucleotide selected from the group consisting of the following
oligonucleotides (a) to (x) and (a1) to (d1); or an oligonucleotide pair selected from the
group consisting of a pair of the following oligonucleotides (a) and (b), a pair of the
following oligonucleotides (c) and (d), a pair of the following oligonucleotides (e) and
(f), a pair of the following oligonucleotides (g) and (h), a pair of the following
15 oligonucleotides (i) and (j), a pair of the following oligonucleotides (k) and (l), a pair of
the following oligonucleotides (m) and (n), a pair of the following oligonucleotides (o)
and (p), a pair of the following oligonucleotides (q) and (r), a pair of the following
oligonucleotides (s) and (t), a pair of the following oligonucleotides (u) and (v), a pair
of the following oligonucleotides (w) and (x), a pair of the following oligonucleotides
20 (y) and (z), a pair of the following oligonucleotides (a1) and (b1), and a pair of the
following oligonucleotides (c1) and (d1):

(a) an oligonucleotide having the base sequence set forth in SEQ ID NO: 13, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 13 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
25 detecting the fatty acid desaturase gene;

(b) an oligonucleotide having the base sequence set forth in SEQ ID NO: 14, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 14 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
detecting the fatty acid desaturase gene;

30 (c) an oligonucleotide having the base sequence set forth in SEQ ID NO: 15, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 15 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
detecting the fatty acid desaturase gene;

- (d) an oligonucleotide having the base sequence set forth in SEQ ID NO: 16, an oligonucleotide having a base sequence set forth in SEQ ID NO: 16 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- 5 (e) an oligonucleotide having the base sequence set forth in SEQ ID NO: 17, an oligonucleotide having a base sequence set forth in SEQ ID NO: 17 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (f) an oligonucleotide having the base sequence set forth in SEQ ID NO: 18, an
10 oligonucleotide having a base sequence set forth in SEQ ID NO: 18 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (g) an oligonucleotide having the base sequence set forth in SEQ ID NO: 19, an oligonucleotide having a base sequence set forth in SEQ ID NO: 19 with a substitution,
15 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (h) an oligonucleotide having the base sequence set forth in SEQ ID NO: 20, an oligonucleotide having a base sequence set forth in SEQ ID NO: 20 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for
20 detecting the fatty acid desaturase gene;
- (i) an oligonucleotide having the base sequence set forth in SEQ ID NO: 21, an oligonucleotide having a base sequence set forth in SEQ ID NO: 21 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- 25 (j) an oligonucleotide having the base sequence set forth in SEQ ID NO: 22, an oligonucleotide having a base sequence set forth in SEQ ID NO: 22 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (k) an oligonucleotide having the base sequence set forth in SEQ ID NO: 23, an
30 oligonucleotide having a base sequence set forth in SEQ ID NO: 23 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (l) an oligonucleotide having the base sequence set forth in SEQ ID NO: 24, an

- oligonucleotide having a base sequence set forth in SEQ ID NO: 24 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the fatty acid desaturase gene;
- (m) an oligonucleotide having the base sequence set forth in SEQ ID NO: 25, an
5 oligonucleotide having a base sequence set forth in SEQ ID NO: 25 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (n) an oligonucleotide having the base sequence set forth in SEQ ID NO: 26, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 26 with a substitution,
10 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;
- (o) an oligonucleotide having the base sequence set forth in SEQ ID NO: 27, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 27 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
15 detecting the β oxidation-related enzyme gene;
- (p) an oligonucleotide having the base sequence set forth in SEQ ID NO: 28, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 28 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
detecting the β oxidation-related enzyme gene;
- 20 (q) an oligonucleotide having the base sequence set forth in SEQ ID NO: 29, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 29 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
detecting the β oxidation-related enzyme gene;
- (r) an oligonucleotide having the base sequence set forth in SEQ ID NO: 30, an
25 oligonucleotide having a base sequence set forth in SEQ ID NO: 30 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
detecting the β oxidation-related enzyme gene;
- (s) an oligonucleotide having the base sequence set forth in SEQ ID NO: 31, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 31 with a substitution,
30 deletion, insertion, or addition of 1 or several nucleotides which can be used for
detecting the β oxidation-related enzyme gene;
- (t) an oligonucleotide having the base sequence set forth in SEQ ID NO: 32, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 32 with a substitution,

deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;

(u) an oligonucleotide having the base sequence set forth in SEQ ID NO: 33, an oligonucleotide having a base sequence set forth in SEQ ID NO: 33 with a substitution,

5 deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;

(v) an oligonucleotide having the base sequence set forth in SEQ ID NO: 34, an oligonucleotide having a base sequence set forth in SEQ ID NO: 34 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for

10 detecting the β oxidation-related enzyme gene;

(w) an oligonucleotide having the base sequence set forth in SEQ ID NO: 35, an oligonucleotide having a base sequence set forth in SEQ ID NO: 35 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;

15 (x) an oligonucleotide having the base sequence set forth in SEQ ID NO: 36, an oligonucleotide having a base sequence set forth in SEQ ID NO: 36 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;

(y) an oligonucleotide having the base sequence set forth in SEQ ID NO: 37, an
20 oligonucleotide having a base sequence set forth in SEQ ID NO: 37 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;

(z) an oligonucleotide having the base sequence set forth in SEQ ID NO: 38, an
25 oligonucleotide having a base sequence set forth in SEQ ID NO: 38 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene;

(a1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 39, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 39 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for
30 detecting the β oxidation-related enzyme gene;

(b1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 40, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 40 with a substitution,
deletion, insertion, or addition of 1 or several nucleotides which can be used for

detecting the β oxidation-related enzyme gene;

(c1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 41, an oligonucleotide having a base sequence set forth in SEQ ID NO: 41 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for

5 detecting the β oxidation-related enzyme gene; and

(d1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 42, an oligonucleotide having a base sequence set forth in SEQ ID NO: 42 with a substitution, deletion, insertion, or addition of 1 or several nucleotides which can be used for detecting the β oxidation-related enzyme gene.

10

{Claim 20}

The oligonucleotide or the oligonucleotide pair according to Claim 19, wherein the oligonucleotide is a nucleic acid primer.

15 {Claim 21}

The oligonucleotide or oligonucleotide pair according to Claim 20, wherein the oligonucleotides (a) and (b), the oligonucleotides (c) and (d), the oligonucleotides (e) and (f), the oligonucleotides (g) and (h), the oligonucleotides (i) and (j), and the oligonucleotides (k) and (l) can function as nucleic acid primers for
20 detecting expression of the fatty acid desaturase gene derived from microorganisms which produce damp-dry malodor-causing substances or for amplifying a gene fragment thereof by polymerase chain reaction.

{Claim 22}

25 The oligonucleotide or the oligonucleotide pair according to Claim 21, wherein the fatty acid desaturase gene is $\Delta 9$ desaturase gene.

{Claim 23}

The oligonucleotide or oligonucleotide pair according to Claim 20,
30 wherein the oligonucleotides (m) and (n), the oligonucleotides (o) and (p), the oligonucleotides (q) and (r), and the oligonucleotides (s) and (t) can function as nucleic acid primers for detecting expression of the β oxidation-related enzyme gene derived from microorganisms which produce damp-dry malodor-causing substances or for

amplifying a gene fragment thereof by polymerase chain reaction.

{Claim 24}

5 The oligonucleotide or the oligonucleotide pair according to Claim 23, wherein the β oxidation-related enzyme gene is fadB gene.

{Claim 25}

10 The oligonucleotide or oligonucleotide pair according to Claim 20, wherein the oligonucleotides (u) and (v), the oligonucleotides (w) and (x), the oligonucleotides (y) and (z), the oligonucleotides (a1) and (b1), and the oligonucleotides (c1) and (d1) can function as nucleic acid primers for detecting expression of the β oxidation-related enzyme gene derived from microorganisms which produce damp-dry malodor-causing substances or for amplifying a gene fragment thereof by polymerase chain reaction.

15

{Claim 26}

The oligonucleotide or the oligonucleotide pair according to Claim 25, wherein the β oxidation-related enzyme gene is fadL gene.

20 {Claim 27}

A kit for evaluating inhibitory effect on damp-dry malodor or a kit for screening of a damp-dry malodor inhibitor, comprising:

microorganisms which produce damp-dry malodor-causing substances;
a sebaceous dirt component; and

25 the oligonucleotide or the oligonucleotide pair according to any one of Claims 19 to 26.

{Claim 28}

30 A kit for detecting microorganisms which produce damp-dry malodor-causing substances, comprising at least one kind of oligonucleotide or oligonucleotide pair according to any one of Claims 19 to 26.

CLAIMS

{Claim 1}

5 A method of evaluating inhibitory effect on damp-dry-malodor, comprising the steps of:

bringing microorganisms which produce damp-dry malodor-causing substances and a test substance into contact with each other in the presence of a sebaceous dirt component;

10 detecting expression of at least one kind of gene selected from a group consisting of a fatty acid desaturase gene and a β oxidation-related enzyme gene derived from the microorganisms; and thereby

evaluating a damp-dry malodor inhibitory function of the test substance based on a change in expression amount of the at least one kind of gene;

15 wherein the expression of the at least one kind of gene is detected by using at least one kind of oligonucleotide pair selected from the group consisting of:

an oligonucleotide pair containing oligonucleotides (a) and (b) described below,
an oligonucleotide pair containing oligonucleotides (c) and (d) described below,
an oligonucleotide pair containing oligonucleotides (e) and (f) described below,
an oligonucleotide pair containing oligonucleotides (g) and (h) described below,
20 an oligonucleotide pair containing oligonucleotides (i) and (j) described below,
an oligonucleotide pair containing oligonucleotides (k) and (l) described below,
an oligonucleotide pair containing oligonucleotides (m) and (n) described below,
an oligonucleotide pair containing oligonucleotides (o) and (p) described below,
an oligonucleotide pair containing oligonucleotides (q) and (r) described below,
25 an oligonucleotide pair containing oligonucleotides (s) and (t) described below,
an oligonucleotide pair containing oligonucleotides (u) and (v) described below,
an oligonucleotide pair containing oligonucleotides (w) and (x) described below,
an oligonucleotide pair containing oligonucleotides (y) and (z) described below,
an oligonucleotide pair containing oligonucleotides (a1) and (b1) described below, and
30 an oligonucleotide pair containing oligonucleotides (c1) and (d1) described below:
(a) an oligonucleotide having the base sequence set forth in SEQ ID NO: 13, an

- oligonucleotide having a base sequence set forth in SEQ ID NO: 13 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (b) an oligonucleotide having the base sequence set forth in SEQ ID NO: 14, an
5 oligonucleotide having a base sequence set forth in SEQ ID NO: 14 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (c) an oligonucleotide having the base sequence set forth in SEQ ID NO: 15, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 15 with a substitution,
10 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (d) an oligonucleotide having the base sequence set forth in SEQ ID NO: 16, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 16 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
15 acid desaturase gene;
- (e) an oligonucleotide having the base sequence set forth in SEQ ID NO: 17, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 17 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
acid desaturase gene;
- 20 (f) an oligonucleotide having the base sequence set forth in SEQ ID NO: 18, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 18 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
acid desaturase gene;
- (g) an oligonucleotide having the base sequence set forth in SEQ ID NO: 19, an
25 oligonucleotide having a base sequence set forth in SEQ ID NO: 19 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
acid desaturase gene;
- (h) an oligonucleotide having the base sequence set forth in SEQ ID NO: 20, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 20 with a substitution,
30 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
acid desaturase gene;

- (i) an oligonucleotide having the base sequence set forth in SEQ ID NO: 21, an oligonucleotide having a base sequence set forth in SEQ ID NO: 21 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- 5 (j) an oligonucleotide having the base sequence set forth in SEQ ID NO: 22, an oligonucleotide having a base sequence set forth in SEQ ID NO: 22 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (k) an oligonucleotide having the base sequence set forth in SEQ ID NO: 23, an
- 10 oligonucleotide having a base sequence set forth in SEQ ID NO: 23 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (l) an oligonucleotide having the base sequence set forth in SEQ ID NO: 24, an oligonucleotide having a base sequence set forth in SEQ ID NO: 24 with a substitution,
- 15 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (m) an oligonucleotide having the base sequence set forth in SEQ ID NO: 25, an oligonucleotide having a base sequence set forth in SEQ ID NO: 25 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
- 20 oxidation-related enzyme gene;
- (n) an oligonucleotide having the base sequence set forth in SEQ ID NO: 26, an oligonucleotide having a base sequence set forth in SEQ ID NO: 26 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- 25 (o) an oligonucleotide having the base sequence set forth in SEQ ID NO: 27, an oligonucleotide having a base sequence set forth in SEQ ID NO: 27 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (p) an oligonucleotide having the base sequence set forth in SEQ ID NO: 28, an
- 30 oligonucleotide having a base sequence set forth in SEQ ID NO: 28 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β

- oxidation-related enzyme gene;
- (q) an oligonucleotide having the base sequence set forth in SEQ ID NO: 29, an oligonucleotide having a base sequence set forth in SEQ ID NO: 29 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
- 5 oxidation-related enzyme gene;
- (r) an oligonucleotide having the base sequence set forth in SEQ ID NO: 30, an oligonucleotide having a base sequence set forth in SEQ ID NO: 30 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- 10 (s) an oligonucleotide having the base sequence set forth in SEQ ID NO: 31, an oligonucleotide having a base sequence set forth in SEQ ID NO: 31 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (t) an oligonucleotide having the base sequence set forth in SEQ ID NO: 32, an
- 15 oligonucleotide having a base sequence set forth in SEQ ID NO: 32 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (u) an oligonucleotide having the base sequence set forth in SEQ ID NO: 33, an oligonucleotide having a base sequence set forth in SEQ ID NO: 33 with a substitution,
- 20 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (v) an oligonucleotide having the base sequence set forth in SEQ ID NO: 34, an oligonucleotide having a base sequence set forth in SEQ ID NO: 34 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
- 25 oxidation-related enzyme gene;
- (w) an oligonucleotide having the base sequence set forth in SEQ ID NO: 35, an oligonucleotide having a base sequence set forth in SEQ ID NO: 35 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- 30 (x) an oligonucleotide having the base sequence set forth in SEQ ID NO: 36, an oligonucleotide having a base sequence set forth in SEQ ID NO: 36 with a substitution,

deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;

(y) an oligonucleotide having the base sequence set forth in SEQ ID NO: 37, an oligonucleotide having a base sequence set forth in SEQ ID NO: 37 with a substitution,

5 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;

(z) an oligonucleotide having the base sequence set forth in SEQ ID NO: 38, an oligonucleotide having a base sequence set forth in SEQ ID NO: 38 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β

10 oxidation-related enzyme gene;

(a1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 39, an oligonucleotide having a base sequence set forth in SEQ ID NO: 39 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;

15 (b1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 40, an oligonucleotide having a base sequence set forth in SEQ ID NO: 40 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;

(c1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 41, an
20 oligonucleotide having a base sequence set forth in SEQ ID NO: 41 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene; and

(d1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 42, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 42 with a substitution,
25 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene.

{Claim 2}

The method according to Claim 1, wherein the damp-dry malodor-causing
30 substances are 4-methyl-3-hexenoic acid.

{Claim 3}

The method according to Claim 1 or 2, wherein the sebaceous dirt component is an anteiso fatty acid.

5 {Claim 4}

The method according to any one of Claims 1 to 3, wherein the fatty acid desaturase gene is $\Delta 9$ desaturase gene.

{Claim 5}

10 The method according to Claim 4,
wherein the expression of the $\Delta 9$ desaturase gene is detected by using at least one kind of oligonucleotide pair selected from the group containing :
the oligonucleotide pair containing the oligonucleotides (a) and (b);
the oligonucleotide pair containing the oligonucleotides (c) and (d);
15 the oligonucleotide pair containing the oligonucleotides (e) and (f);
the oligonucleotide pair containing the oligonucleotides (g) and (h);
the oligonucleotide pair containing the oligonucleotides (i) and (j); and
the oligonucleotide pair containing the oligonucleotides (k) and (l).

20 {Claim 6}

The method according to any one of Claims 1 to 3, wherein the β oxidation-related enzyme gene is at least one kind of gene selected from the group consisting of fadB gene and fadD gene.

25 {Claim 7}

The method according to Claim 6,
wherein the expression of the fadB gene is detected by using at least one kind of oligonucleotide pair selected from the group consisting of:
the oligonucleotide pair containing the oligonucleotides (m) and (n);
30 the oligonucleotide pair containing the oligonucleotides (o) and (p);
the oligonucleotide pair containing the oligonucleotides (q) and (r); and

the oligonucleotide pair containing the oligonucleotides (s) and (t).

{Claim 8}

The method according to Claim 6,

- 5 wherein the expression of the fadD gene is detected by using at least one kind of oligonucleotide pair selected from the group consisting of :
- the oligonucleotide pair containing the oligonucleotides (u) and (v);
- the oligonucleotide pair containing the oligonucleotides (w) and (x);
- the oligonucleotide pair containing the oligonucleotides (y) and (z);
- 10 the oligonucleotide pair containing the oligonucleotides (a1) and (b1); and
- the oligonucleotide pair containing the oligonucleotides (c1) and (d1).

{Claim 9}

- The method according to any one of Claims 1 to 8, wherein the
- 15 microorganisms are at least one kind of microbial strain selected from the group consisting of species of Moraxella sp. and Moraxella osloensis.

{Claim 10}

- A method of screening a damp-dry malodor inhibitor, which comprises
- 20 selecting a test substance capable of reducing the expression amount of the at least one kind of gene, based on the method described in any one of Claims 1 to 9.

{Claim 11}

- A method of detecting microorganisms which produce damp-dry malodor-
- 25 causing substances, comprising the steps of:
- amplifying at least one kind of fragment of gene selected from a group consisting of a fatty acid desaturase gene and a β oxidation-related enzyme gene that are derived from microorganisms which produce damp-dry malodor-causing substances;
- determining the presence or absence of an amplified fragment; and thereby
- 30 detecting the microorganisms which produce damp-dry malodor-causing substances,

wherein the detection of the microorganisms which produce damp-dry malodor-causing substances is performed by using at least one kind of oligonucleotide pair selected from the group consisting of:

- an oligonucleotide pair containing oligonucleotides (a) and (b) described below,
- 5 an oligonucleotide pair containing oligonucleotides (c) and (d) described below,
- an oligonucleotide pair containing oligonucleotides (e) and (f) described below,
- an oligonucleotide pair containing oligonucleotides (g) and (h) described below,
- an oligonucleotide pair containing oligonucleotides (i) and (j) described below,
- an oligonucleotide pair containing oligonucleotides (k) and (l) described below,
- 10 an oligonucleotide pair containing oligonucleotides (m) and (n) described below,
- an oligonucleotide pair containing oligonucleotides (o) and (p) described below,
- an oligonucleotide pair containing oligonucleotides (q) and (r) described below,
- an oligonucleotide pair containing oligonucleotides (s) and (t) described below,
- an oligonucleotide pair containing oligonucleotides (u) and (v) described below,
- 15 an oligonucleotide pair containing oligonucleotides (w) and (x) described below,
- an oligonucleotide pair containing oligonucleotides (y) and (z) described below,
- an oligonucleotide pair containing oligonucleotides (a1) and (b1) described below, and
- an oligonucleotide pair containing oligonucleotides (c1) and (d1) described below:
- (a) an oligonucleotide having the base sequence set forth in SEQ ID NO: 13, an
- 20 oligonucleotide having a base sequence set forth in SEQ ID NO: 13 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (b) an oligonucleotide having the base sequence set forth in SEQ ID NO: 14, an
- oligonucleotide having a base sequence set forth in SEQ ID NO: 14 with a substitution,
- 25 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (c) an oligonucleotide having the base sequence set forth in SEQ ID NO: 15, an
- oligonucleotide having a base sequence set forth in SEQ ID NO: 15 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
- 30 acid desaturase gene;
- (d) an oligonucleotide having the base sequence set forth in SEQ ID NO: 16, an

- oligonucleotide having a base sequence set forth in SEQ ID NO: 16 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (e) an oligonucleotide having the base sequence set forth in SEQ ID NO: 17, an
5 oligonucleotide having a base sequence set forth in SEQ ID NO: 17 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (f) an oligonucleotide having the base sequence set forth in SEQ ID NO: 18, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 18 with a substitution,
10 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- (g) an oligonucleotide having the base sequence set forth in SEQ ID NO: 19, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 19 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
15 acid desaturase gene;
- (h) an oligonucleotide having the base sequence set forth in SEQ ID NO: 20, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 20 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
acid desaturase gene;
- 20 (i) an oligonucleotide having the base sequence set forth in SEQ ID NO: 21, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 21 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
acid desaturase gene;
- (j) an oligonucleotide having the base sequence set forth in SEQ ID NO: 22, an
25 oligonucleotide having a base sequence set forth in SEQ ID NO: 22 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
acid desaturase gene;
- (k) an oligonucleotide having the base sequence set forth in SEQ ID NO: 23, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 23 with a substitution,
30 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty
acid desaturase gene;

- (l) an oligonucleotide having the base sequence set forth in SEQ ID NO: 24, an oligonucleotide having a base sequence set forth in SEQ ID NO: 24 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
- 5 (m) an oligonucleotide having the base sequence set forth in SEQ ID NO: 25, an oligonucleotide having a base sequence set forth in SEQ ID NO: 25 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (n) an oligonucleotide having the base sequence set forth in SEQ ID NO: 26, an
10 oligonucleotide having a base sequence set forth in SEQ ID NO: 26 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (o) an oligonucleotide having the base sequence set forth in SEQ ID NO: 27, an oligonucleotide having a base sequence set forth in SEQ ID NO: 27 with a substitution,
15 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (p) an oligonucleotide having the base sequence set forth in SEQ ID NO: 28, an oligonucleotide having a base sequence set forth in SEQ ID NO: 28 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
20 oxidation-related enzyme gene;
- (q) an oligonucleotide having the base sequence set forth in SEQ ID NO: 29, an oligonucleotide having a base sequence set forth in SEQ ID NO: 29 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- 25 (r) an oligonucleotide having the base sequence set forth in SEQ ID NO: 30, an oligonucleotide having a base sequence set forth in SEQ ID NO: 30 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (s) an oligonucleotide having the base sequence set forth in SEQ ID NO: 31, an
30 oligonucleotide having a base sequence set forth in SEQ ID NO: 31 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β

- oxidation-related enzyme gene;
- (t) an oligonucleotide having the base sequence set forth in SEQ ID NO: 32, an oligonucleotide having a base sequence set forth in SEQ ID NO: 32 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- 5 (u) an oligonucleotide having the base sequence set forth in SEQ ID NO: 33, an oligonucleotide having a base sequence set forth in SEQ ID NO: 33 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- 10 (v) an oligonucleotide having the base sequence set forth in SEQ ID NO: 34, an oligonucleotide having a base sequence set forth in SEQ ID NO: 34 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (w) an oligonucleotide having the base sequence set forth in SEQ ID NO: 35, an
- 15 oligonucleotide having a base sequence set forth in SEQ ID NO: 35 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (x) an oligonucleotide having the base sequence set forth in SEQ ID NO: 36, an oligonucleotide having a base sequence set forth in SEQ ID NO: 36 with a substitution,
- 20 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (y) an oligonucleotide having the base sequence set forth in SEQ ID NO: 37, an oligonucleotide having a base sequence set forth in SEQ ID NO: 37 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
- 25 oxidation-related enzyme gene;
- (z) an oligonucleotide having the base sequence set forth in SEQ ID NO: 38, an oligonucleotide having a base sequence set forth in SEQ ID NO: 38 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- 30 (a1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 39, an oligonucleotide having a base sequence set forth in SEQ ID NO: 39 with a substitution,

deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;

(b1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 40, an oligonucleotide having a base sequence set forth in SEQ ID NO: 40 with a substitution,
5 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;

(c1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 41, an oligonucleotide having a base sequence set forth in SEQ ID NO: 41 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
10 oxidation-related enzyme gene; and

(d1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 42, an oligonucleotide having a base sequence set forth in SEQ ID NO: 42 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene.

15

{Claim 12}

The method according to Claim 11, wherein the damp-dry malodor-causing substances are 4-methyl-3-hexenoic acid.

20 {Claim 13}

The method according to Claim 11 or 12, wherein the fatty acid desaturase gene is $\Delta 9$ desaturase gene.

{Claim 14}

25

The method according to Claim 13,
wherein a fragment of the $\Delta 9$ desaturase gene is amplified by using at least one kind of oligonucleotide pair selected from the group consisting of:
the oligonucleotide pair containing the oligonucleotides (a) and (b);
the oligonucleotide pair containing the oligonucleotides (c) and (d);
30 the oligonucleotide pair containing the oligonucleotides (e) and (f);
the oligonucleotide pair containing the oligonucleotides (g) and (h);

the oligonucleotide pair containing the oligonucleotides (i) and (j); and
the oligonucleotide pair containing the oligonucleotides (k) and (l).

{Claim 15}

- 5 The method according to Claim 11 or 12, wherein the β oxidation-related enzyme gene is at least one kind of gene selected from the group consisting of fadB gene and fadD gene.

{Claim 16}

- 10 The method described in according to Claim 15,
wherein a fragment of the fadB gene is amplified by using at least one kind of oligonucleotide pair selected from the group consisting of:
the oligonucleotide pair containing the oligonucleotides (m) and (n);
the oligonucleotide pair containing the oligonucleotides (o) and (p);
15 the oligonucleotide pair containing the oligonucleotides (q) and (r); and
the oligonucleotide pair containing the oligonucleotides (s) and (t).

{Claim 17}

- The method according to Claim 15,
20 wherein a fragment of the fadD gene is amplified by using at least one kind of oligonucleotide pair selected from the group consisting of:
the oligonucleotide pair containing the oligonucleotides (u) and (v);
the oligonucleotide pair containing the oligonucleotides (w) and (x);
the oligonucleotide pair containing the oligonucleotides (y) and (z);
25 the oligonucleotide pair containing the oligonucleotides (a1) and (b1); and
the oligonucleotide pair containing the oligonucleotides (c1) and (d1).

{Claim 18}

- The method according to any one of Claims 11 to 17, wherein the
30 microorganisms are at least one kind of microbial strain selected from the group consisting of species of Moraxella sp. and Moraxella osloensis.

{Claim 19}

- An oligonucleotide pair selected from the group consisting of a pair of the following oligonucleotides (a) and (b), a pair of the following oligonucleotides (c) and (d), a pair of the following oligonucleotides (e) and (f), a pair of the following oligonucleotides (g) and (h), a pair of the following oligonucleotides (i) and (j), a pair of the following oligonucleotides (k) and (l), a pair of the following oligonucleotides (m) and (n), a pair of the following oligonucleotides (o) and (p), a pair of the following oligonucleotides (q) and (r), a pair of the following oligonucleotides (s) and (t), a pair of the following oligonucleotides (u) and (v), a pair of the following oligonucleotides (w) and (x), a pair of the following oligonucleotides (y) and (z), a pair of the following oligonucleotides (a1) and (b1), and a pair of the following oligonucleotides (c1) and (d1):
- (a) an oligonucleotide having the base sequence set forth in SEQ ID NO: 13, an oligonucleotide having a base sequence set forth in SEQ ID NO: 13 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
 - (b) an oligonucleotide having the base sequence set forth in SEQ ID NO: 14, an oligonucleotide having a base sequence set forth in SEQ ID NO: 14 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
 - (c) an oligonucleotide having the base sequence set forth in SEQ ID NO: 15, an oligonucleotide having a base sequence set forth in SEQ ID NO: 15 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
 - (d) an oligonucleotide having the base sequence set forth in SEQ ID NO: 16, an oligonucleotide having a base sequence set forth in SEQ ID NO: 16 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;
 - (e) an oligonucleotide having the base sequence set forth in SEQ ID NO: 17, an oligonucleotide having a base sequence set forth in SEQ ID NO: 17 with a substitution,

deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;

(f) an oligonucleotide having the base sequence set forth in SEQ ID NO: 18, an oligonucleotide having a base sequence set forth in SEQ ID NO: 18 with a substitution,

5 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;

(g) an oligonucleotide having the base sequence set forth in SEQ ID NO: 19, an oligonucleotide having a base sequence set forth in SEQ ID NO: 19 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty

10 acid desaturase gene;

(h) an oligonucleotide having the base sequence set forth in SEQ ID NO: 20, an oligonucleotide having a base sequence set forth in SEQ ID NO: 20 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;

15 (i) an oligonucleotide having the base sequence set forth in SEQ ID NO: 21, an oligonucleotide having a base sequence set forth in SEQ ID NO: 21 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;

(j) an oligonucleotide having the base sequence set forth in SEQ ID NO: 22, an
20 oligonucleotide having a base sequence set forth in SEQ ID NO: 22 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;

(k) an oligonucleotide having the base sequence set forth in SEQ ID NO: 23, an
25 oligonucleotide having a base sequence set forth in SEQ ID NO: 23 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;

(l) an oligonucleotide having the base sequence set forth in SEQ ID NO: 24, an
30 oligonucleotide having a base sequence set forth in SEQ ID NO: 24 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the fatty acid desaturase gene;

(m) an oligonucleotide having the base sequence set forth in SEQ ID NO: 25, an

- oligonucleotide having a base sequence set forth in SEQ ID NO: 25 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (n) an oligonucleotide having the base sequence set forth in SEQ ID NO: 26, an
5 oligonucleotide having a base sequence set forth in SEQ ID NO: 26 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (o) an oligonucleotide having the base sequence set forth in SEQ ID NO: 27, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 27 with a substitution,
10 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (p) an oligonucleotide having the base sequence set forth in SEQ ID NO: 28, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 28 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
15 oxidation-related enzyme gene;
- (q) an oligonucleotide having the base sequence set forth in SEQ ID NO: 29, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 29 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
oxidation-related enzyme gene;
- 20 (r) an oligonucleotide having the base sequence set forth in SEQ ID NO: 30, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 30 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
oxidation-related enzyme gene;
- (s) an oligonucleotide having the base sequence set forth in SEQ ID NO: 31, an
25 oligonucleotide having a base sequence set forth in SEQ ID NO: 31 with a substitution,
deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
oxidation-related enzyme gene;
- (t) an oligonucleotide having the base sequence set forth in SEQ ID NO: 32, an
oligonucleotide having a base sequence set forth in SEQ ID NO: 32 with a substitution,
30 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
oxidation-related enzyme gene;

- (u) an oligonucleotide having the base sequence set forth in SEQ ID NO: 33, an oligonucleotide having a base sequence set forth in SEQ ID NO: 33 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- 5 (v) an oligonucleotide having the base sequence set forth in SEQ ID NO: 34, an oligonucleotide having a base sequence set forth in SEQ ID NO: 34 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (w) an oligonucleotide having the base sequence set forth in SEQ ID NO: 35, an
- 10 oligonucleotide having a base sequence set forth in SEQ ID NO: 35 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (x) an oligonucleotide having the base sequence set forth in SEQ ID NO: 36, an oligonucleotide having a base sequence set forth in SEQ ID NO: 36 with a substitution,
- 15 deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (y) an oligonucleotide having the base sequence set forth in SEQ ID NO: 37, an oligonucleotide having a base sequence set forth in SEQ ID NO: 37 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β
- 20 oxidation-related enzyme gene;
- (z) an oligonucleotide having the base sequence set forth in SEQ ID NO: 38, an oligonucleotide having a base sequence set forth in SEQ ID NO: 38 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- 25 (a1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 39, an oligonucleotide having a base sequence set forth in SEQ ID NO: 39 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene;
- (b1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 40, an
- 30 oligonucleotide having a base sequence set forth in SEQ ID NO: 40 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β

oxidation-related enzyme gene;

(c1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 41, an oligonucleotide having a base sequence set forth in SEQ ID NO: 41 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β

5 oxidation-related enzyme gene; and

(d1) an oligonucleotide having the base sequence set forth in SEQ ID NO: 42, an oligonucleotide having a base sequence set forth in SEQ ID NO: 42 with a substitution, deletion, insertion, or addition of 1 nucleotide which can be used for detecting the β oxidation-related enzyme gene.

10

{Claim 20}

The oligonucleotide pair according to Claim 19, wherein the oligonucleotide is a nucleic acid primer.

15 {Claim 21}

The oligonucleotide pair according to Claim 20, wherein the oligonucleotides (a) and (b), the oligonucleotides (c) and (d), the oligonucleotides (e) and (f), the oligonucleotides (g) and (h), the oligonucleotides (i) and (j), and the oligonucleotides (k) and (l) can function as nucleic acid primers for
20 detecting expression of the fatty acid desaturase gene derived from microorganisms which produce damp-dry malodor-causing substances or for amplifying a gene fragment thereof by polymerase chain reaction.

{Claim 22}

25 The oligonucleotide pair according to Claim 21, wherein the fatty acid desaturase gene is $\Delta 9$ desaturase gene.

{Claim 23}

The oligonucleotide pair according to Claim 20,
30 wherein the oligonucleotides (m) and (n), the oligonucleotides (o) and (p), the oligonucleotides (q) and (r), and the oligonucleotides (s) and (t) can function as nucleic

acid primers for detecting expression of the β oxidation-related enzyme gene derived from microorganisms which produce damp-dry malodor-causing substances or for amplifying a gene fragment thereof by polymerase chain reaction.

5 {Claim 24}

The oligonucleotide pair according to Claim 23, wherein the β oxidation-related enzyme gene is fadB gene.

{Claim 25}

10 The oligonucleotide pair according to Claim 20,
wherein the oligonucleotides (u) and (v), the oligonucleotides (w) and (x), the
oligonucleotides (y) and (z), the oligonucleotides (a1) and (b1), and the oligonucleotides
(c1) and (d1) can function as nucleic acid primers for detecting expression of the β
oxidation-related enzyme gene derived from microorganisms which produce damp-dry
15 malodor-causing substances or for amplifying a gene fragment thereof by polymerase
chain reaction.

{Claim 26}

The oligonucleotide pair according to Claim 25, wherein the β oxidation-
20 related enzyme gene is fadD gene.

{Claim 27}

A kit for evaluating inhibitory effect on damp-dry malodor or a kit for
screening of a damp-dry malodor inhibitor, comprising:
25 microorganisms which produce damp-dry malodor-causing substances;
a sebaceous dirt component; and
the oligonucleotide pair according to any one of Claims 19 to 26.

{Claim 28}

30 A kit for detecting microorganisms which produce damp-dry malodor-causing
substances, comprising at least one kind of oligonucleotide pair according to any one of

Claims 19 to 26.